O&AM Costs: Reducing Operating Overheads

- Airspan has advantages for *Operation and Maintenance*:
  - Management into the Subscribers Premises
  - Ability to Monitor "Quality of Service"
  - Can't be Dug Up, or Cut like copper.
  - Cannot be Stolen in the same way as Copper.
  - Simplified Fault Finding
  - Accelerated Repair and Correction times
  - Reduced Requirement for Operating Staff

Airspan can be <u>Justified</u> solely on Operational Cost Reduction!

Premium Services: ISDN and Digital Data

- Create "Premium Service" networks without a Large re-investment in existing Infrastructure.
- Target Deployment at "High Value" Customers
- Airspan can be used to Construct Overlay Networks;
  - ISDN (especially at 3km+)
  - Digital Leased Line Data circuits (64 and 128 kbit/s) up to 15 km
- Provide connection diversity for Sensitive Users
- Prevent Eavesdropping using CDMA's inherent security.
- Direct "End-toEnd" Digital interconnect into PSTN for Highest possible Quality of Service - Avoid Poor Quality Copper links.

Ideal for Serving High-Value / VIP Customers who require PREMIUM Service

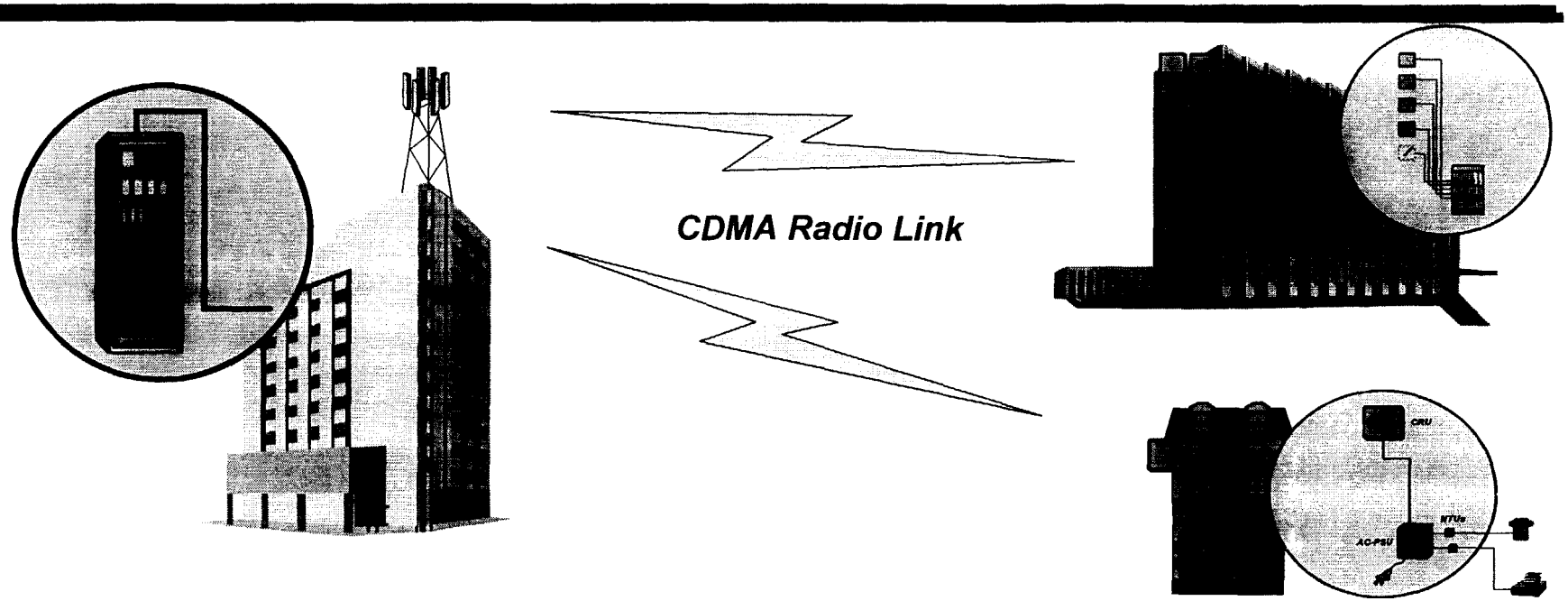
Benefits Summary

- In summary, Airspan can;
  - Improve Cash-Flow when Extending / Growing Networks
  - Reduce Levels of Investment
  - Provide an Operator with Greater Reach
  - Service Deployment in Months not Years
  - More Flexibility in Service Provision
  - Better Responsiveness to Customer Demands
  - Enhanced Reliability
  - Reduce Operataing Costs - Especially Long Loops
  - Provide "Overlay" Premium Service Networks

DSC's Airspan: A Powerful Deployment Tool for New and Existing Network Operators

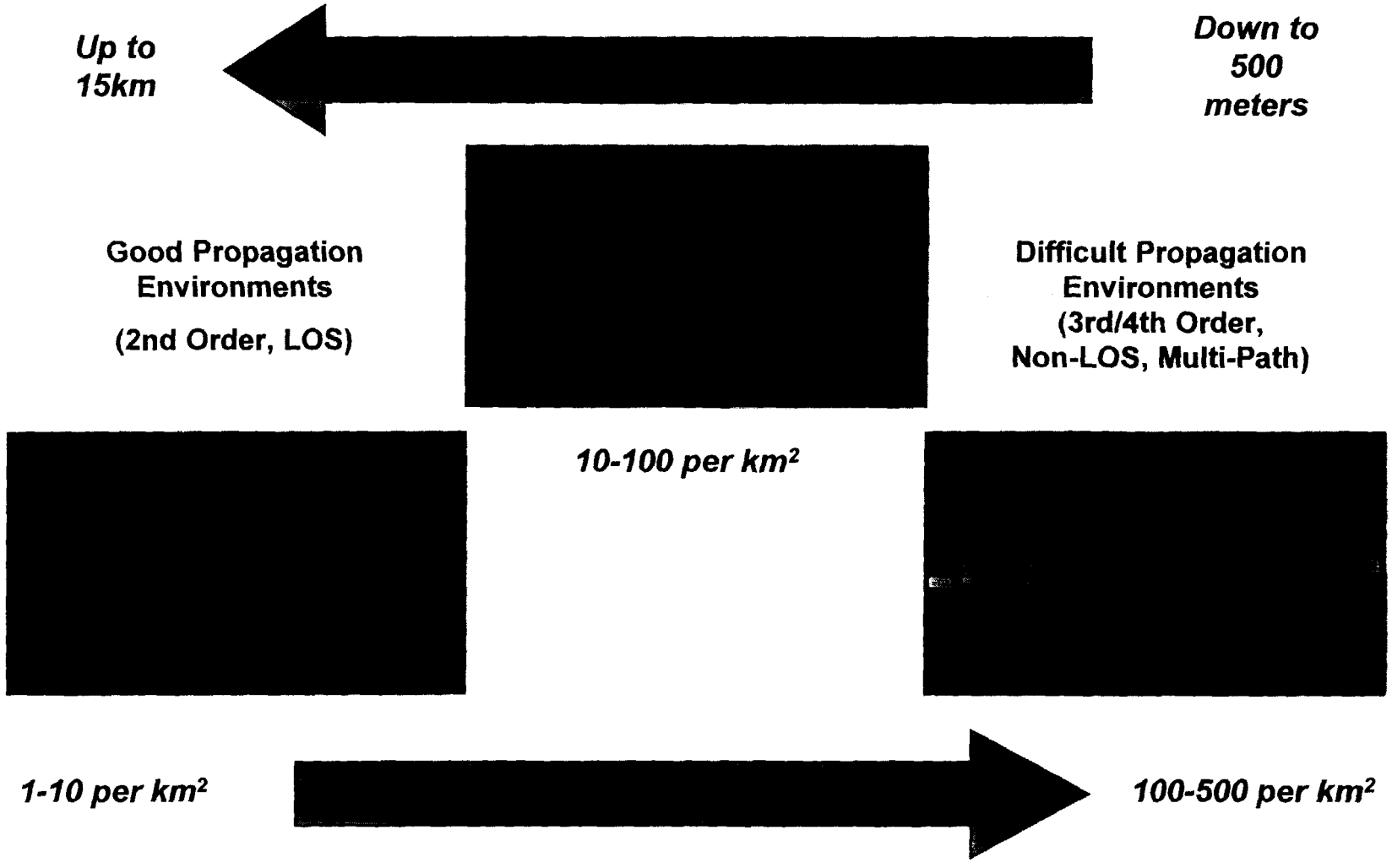
System Overview

Airspan System Overview



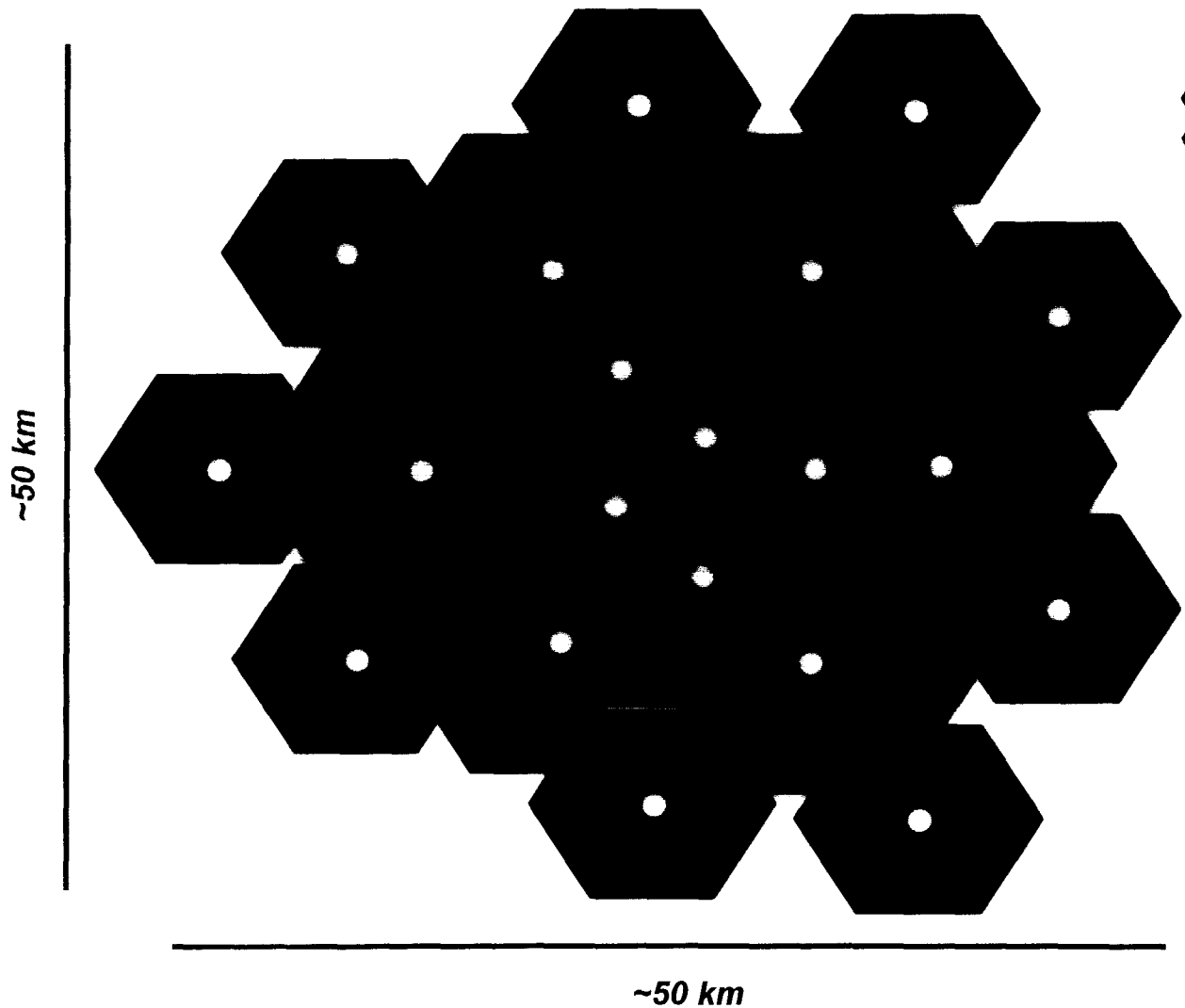
- A "CDMA" based Digital Radio System for *Wireless Fixed Access*.
- *An Alternative* to "Copper in the Local Loop" to provide Telephony, Data and Basic Rate ISDN Services.
- Customers use *Standard* Phones, Fax, Modems.
- Supports end-to-end Digital Connectivity.
- Provides *Fixed Network Performance* (i.e. User Bit Rate = 64kbit/s, Low Delay, Good BER)
- Coverage is Wide Area and "*Cellular-Like*", Frequency Reuse N ~ 1 to 3.

System Deployment



Deployment in Rural, Suburban and Urban Areas

WFA Network Deployment



5 x Sectored Urban (3km)

6 x Sectored Suburban (6km)

9 x Omni Rural (8km)

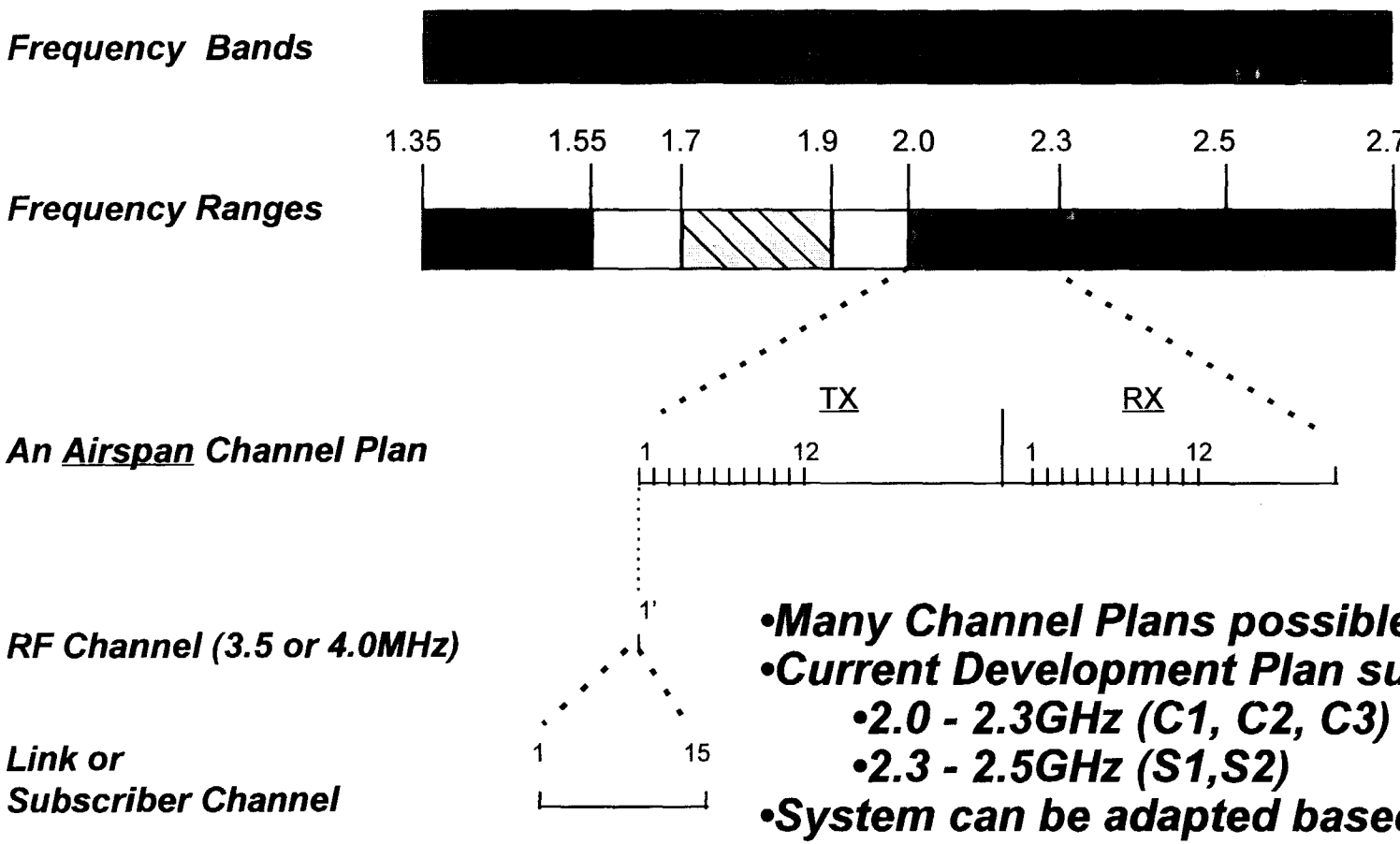
Wide-Area coverage is "Cellular-Like"

Use of the Radio Spectrum

- Airspan can be adapted to operate in various frequency ranges between 1.35 and 2.7GHz.
  - ITU-R frequency management, e.g. Rec. F701
  - Licensed spectrum operation
  - Co-ordination with other systems
  - Practical bands of operation
    - Achievable cell size
    - Radio Coverage
    - Rainfall immunity

- These bands are often relatively uncongested, and therefore ideal for Fixed WLL, avoiding operation in the 900MHz Cellular Bands
  - Cellular Operators are constrained to these Bands
  - They are becoming very congested - especially in Urban areas
  - Cellular operators now seeking higher spectrum i.e.. DCS 1800

Frequency Ranges Supported



- *Many Channel Plans possible*
- *Current Development Plan supports*
  - *2.0 - 2.3GHz (C1, C2, C3)*
  - *2.3 - 2.5GHz (S1,S2)*
- *System can be adapted based on Customer requirement*
  - *Typically 6-9 months lead-time*

Services Supported

- *Basic Telephony* (POTS)
  - Dial Tone
- Advanced Telephony
  - Group 3 Facsimile
  - Voice Band Data, V22, V22bis, V32, V.FC, V.34 (2.4 - 28.8kbit/s)
  - CLASS Features, i.e: Calling Line ID.
- *Payphones* (12-16kHz SPM)
- *ISDN Basic Rate* Access (2B+D)
  - Subscriber: Basic Rate S_o interface
  - Network: Primary Rate (2Mbit/s) DSS1 (Euro-ISDN)
- *Lease Line Data* 2 x 64kbit/s Data on G.703

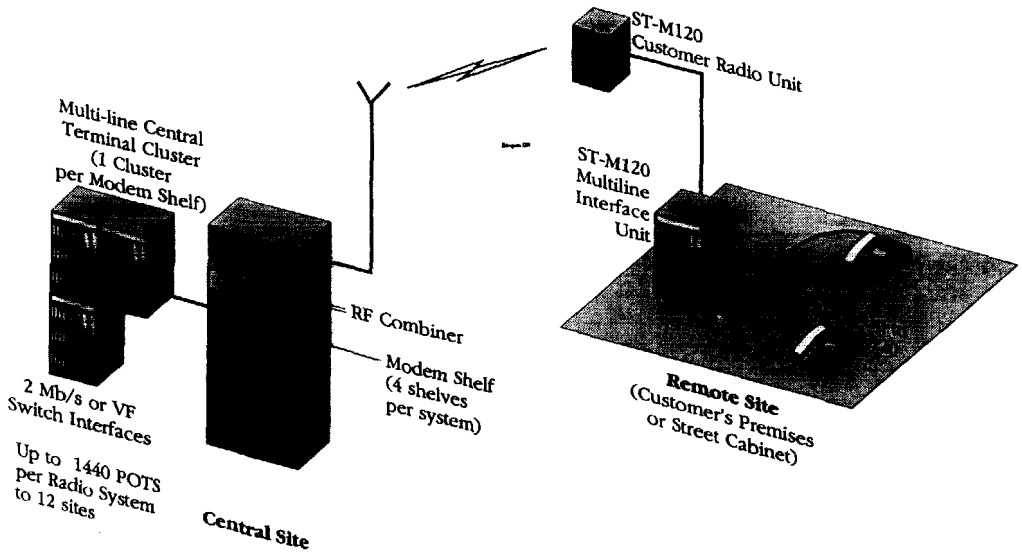
Airspan is a Multi-Service Application Platform

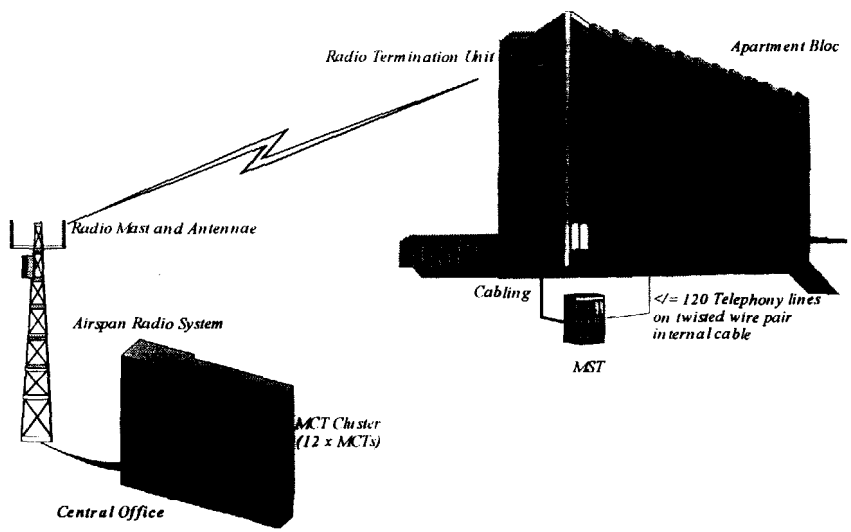
Service Quality

- *Availability* > 99.5%, subject to network planning
- *Delay* < 1ms - hence no Echo Cancellation
- *Grade of Service*
  - Non-Blocking (Fixed Assignment)
  - Trunk based Blocking - up to 15:1 Concentration (Multiline)
  - Blocking (Demand Assignment) - Future
- *Error Performance*: Link BER < 10^{-7} for Digital Services
- *Speech Quality*: 64Kbit/s PCM, MOS better than 5.0+
- Security and Fraud prevention:
  - Air Interface: SS-CDMA Encoded
  - Subscriber Terminal Authentication

Airspan supports Fixed Network Quality

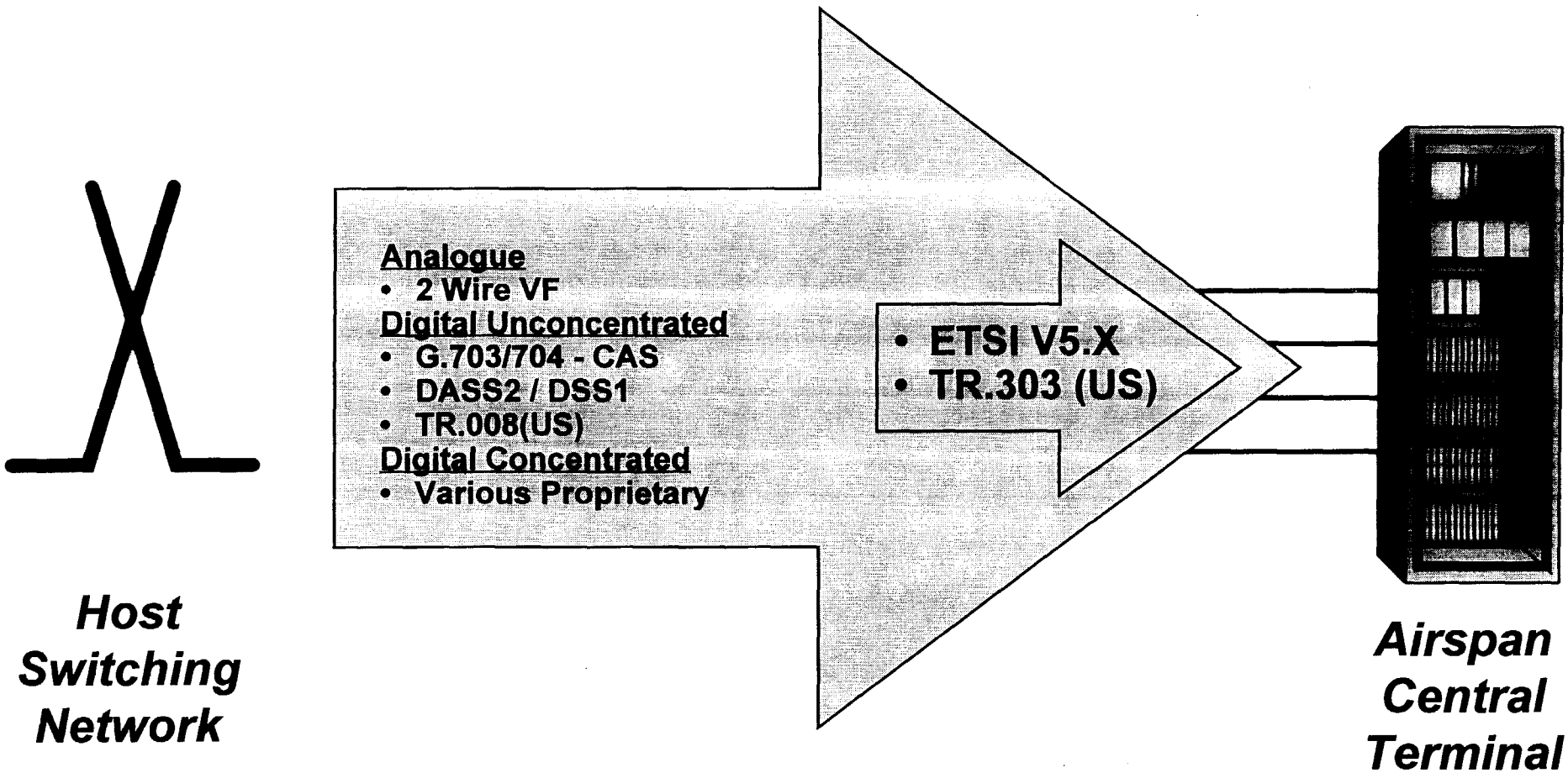
Airspan Multi-line





- **Airspan Multi-line is the combination of Airspan and LS-120**
- **The system provide "Graded Service" of up to 120 lines per Site**
- **Suitable for High Density Telephony Applications, in High-Rise Offices and Apartments.**

Network Interface Options



Current Multiplicity of Network Interfaces

WFA Management Systems

- Provide Wireless Local Loop OA&M Benefits;
  - Allow "*Management*" into the End-Users Premises
  - The Ability to monitor "Quality of Service"
  - Provide Simplified Fault Finding
  - Accelerated Repair and Correction Times
  - Reduced Requirement for Operating Staff - Automation
- Systems for Different Networks
  - Modular Solutions - Different Size Networks
  - Different Management Styles
  - Centralized vs Distributed
  - Local vs Remote.

Operator Requirements change depending on Airspan Application Scenario

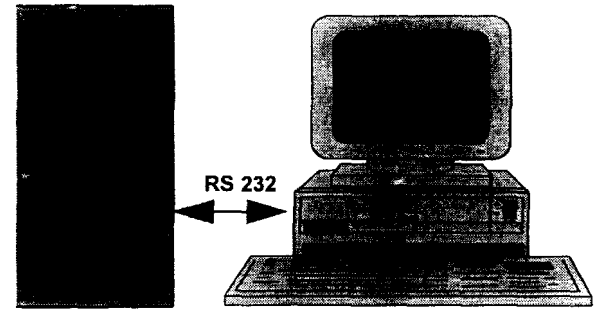
Management System Functionality

Airspan has Two Management Systems

- **Local Management - "*Site Controller (ASC)*"**
  - Local Diagnostics/Testing, both CT and ST
  - Alarm Reporting
  - Control and Monitor Local Performance Statistics
  - Configure and Activate Links and Circuits (Installation Aid)
- **Centralized Management - "Element Manager *(SNMP)*"**
  - Basic Functions as above, plus
  - Enhanced line capacity
  - Equipment Provisioning
  - Forward Alarms based on Filtering
  - Summarize Performance Statistics
  - Support "Q3" Interfaces to Higher Level Management

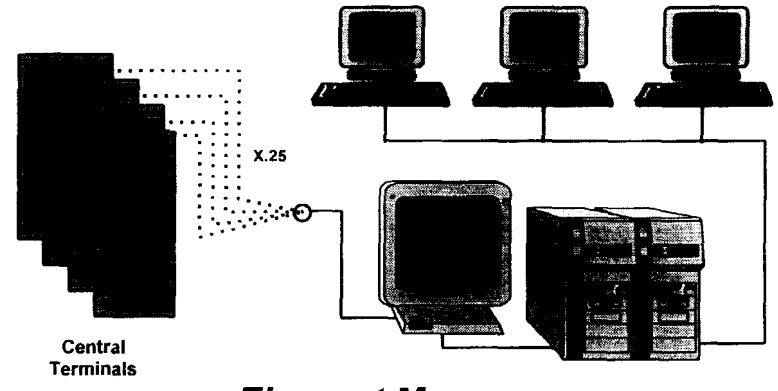
Management System Implementation

- **Site Controller (ASC)**
  - Based on a '486 PC
  - Runs on Windows (3.1 / 95 / NT)
  - Up to 16 Modem Shelves on 4 CTs
  - Can be Remoted via Modem



Site Controller

- **Element Manager (SNMP)**
  - Per ITU - T "TMN" structure
  - Based on Workstations (HP/SUN)
  - Runs on UNIX and HP OpenView v4.0
  - Up to 1000 Central Terminals (50K lines)
  - Centralized Mgmt. via X.25 Network
  - "Network Management" Layer interface

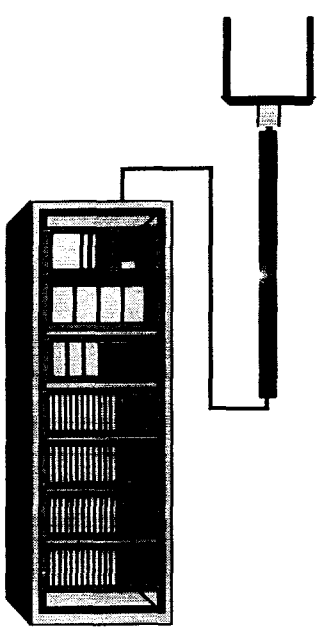


Element Manager

Airspan Applications

Airspan Application Scenarios

Airspan Applications



"Plain Old Telephony Service - POTS".
Basic Telephony Services using Radio instead of Copper based infrastructure

"Multi-line Telephony".
High-Density Graded Service for Subscribers in Office Blocks or High-Rise Residential Apartments

"Advanced Telephony - the Second Line".
CLASS / CLI Services and In-band Data over Telephony to access to the Global Internet.

"LAN Interconnect".
Typically a "Data" only application that uses the WLL system to access remote locations.

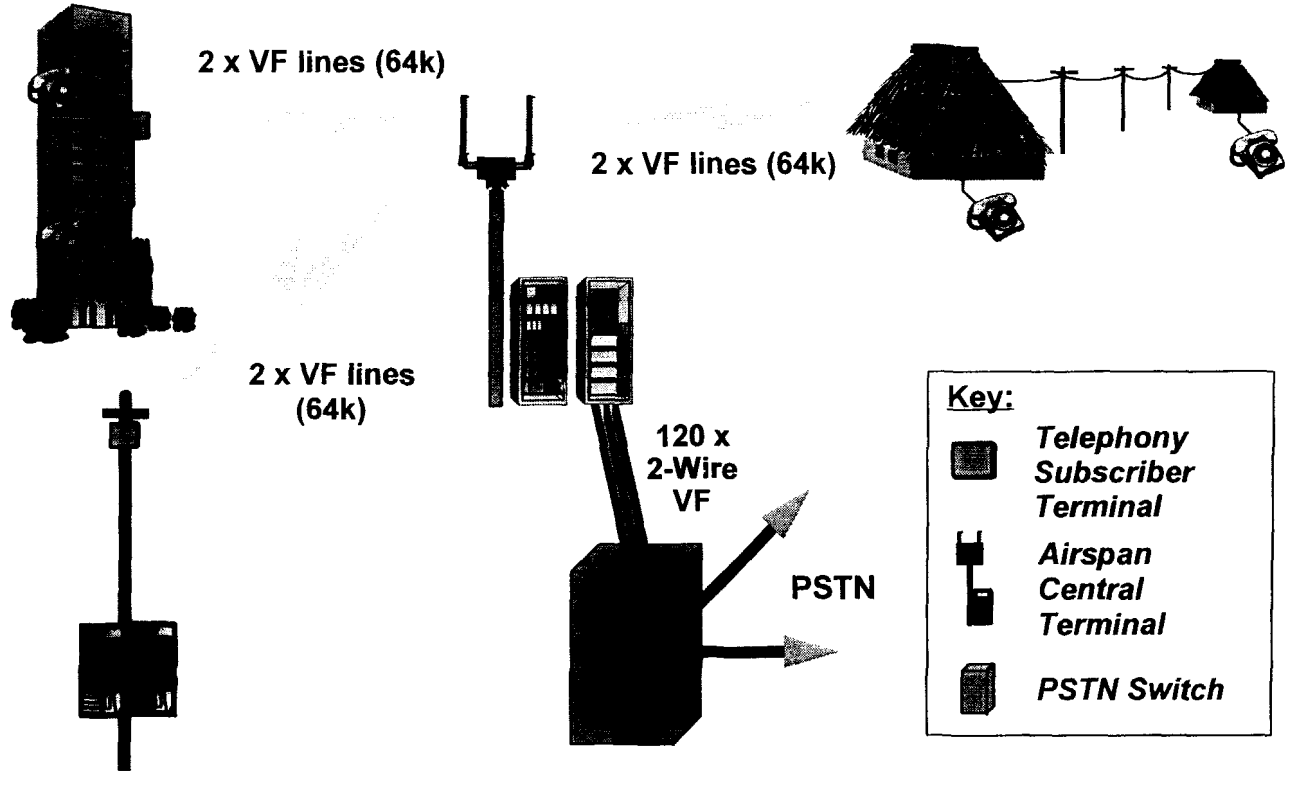
"Integrated Voice and Data".
Classical ISDN deployment in Private and Public networks.

"Microcellular Trunking"
Transmission for GSM, DECT, PCS or DCS1800 Microcells.

"Plain Old Telephony Service - POTS"

Application Characteristics

- Rural, Suburban or Urban Deployment
- Simple Analogue Telephony Service (POTS)
- One or Two Lines per Location
  - Payphones
- First Dial-Tone Applications
  - Primarily for Developing Country Operators
  - Rollout New Infrastructure Quickly



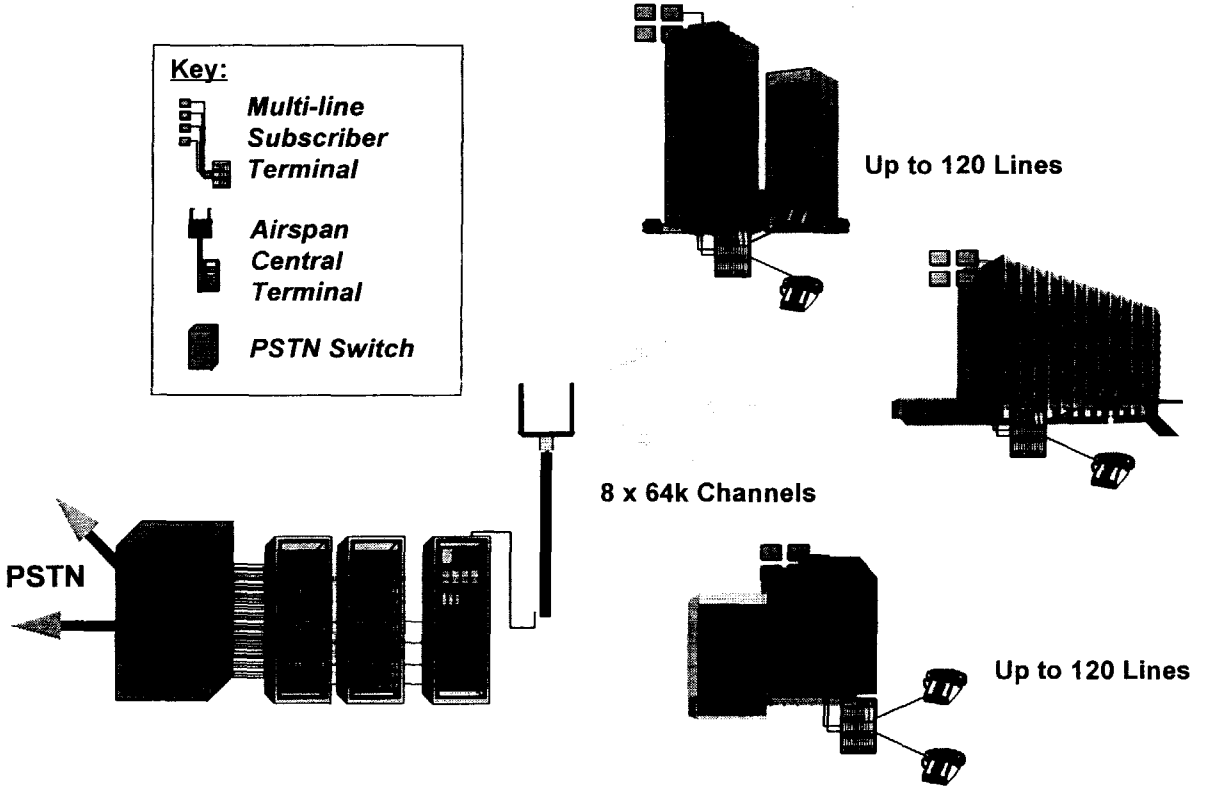
DSC Equipment Deployed

- Airspan Central Terminal
- ST-V2 - Dual Analogue Telephony Subscriber Terminals
- Optionally; Channel Banks (either CP600 or LS120) for VF Switch Interconnect.

"Multi-line Telephony"

Application Characteristics

- Suburban and Urban Deployment
- Clustered End-Users - such as Office Blocks and High-rise Apartment Buildings.
- Fully Transparent "Graded" Telephony Service - 64 kbit/s PCM - Equivalent to Copper Quality.
- Airspan Multi-line allows the Operator to;
  - Provide Cost effective Service.
  - Deploy large numbers of new Lines quickly



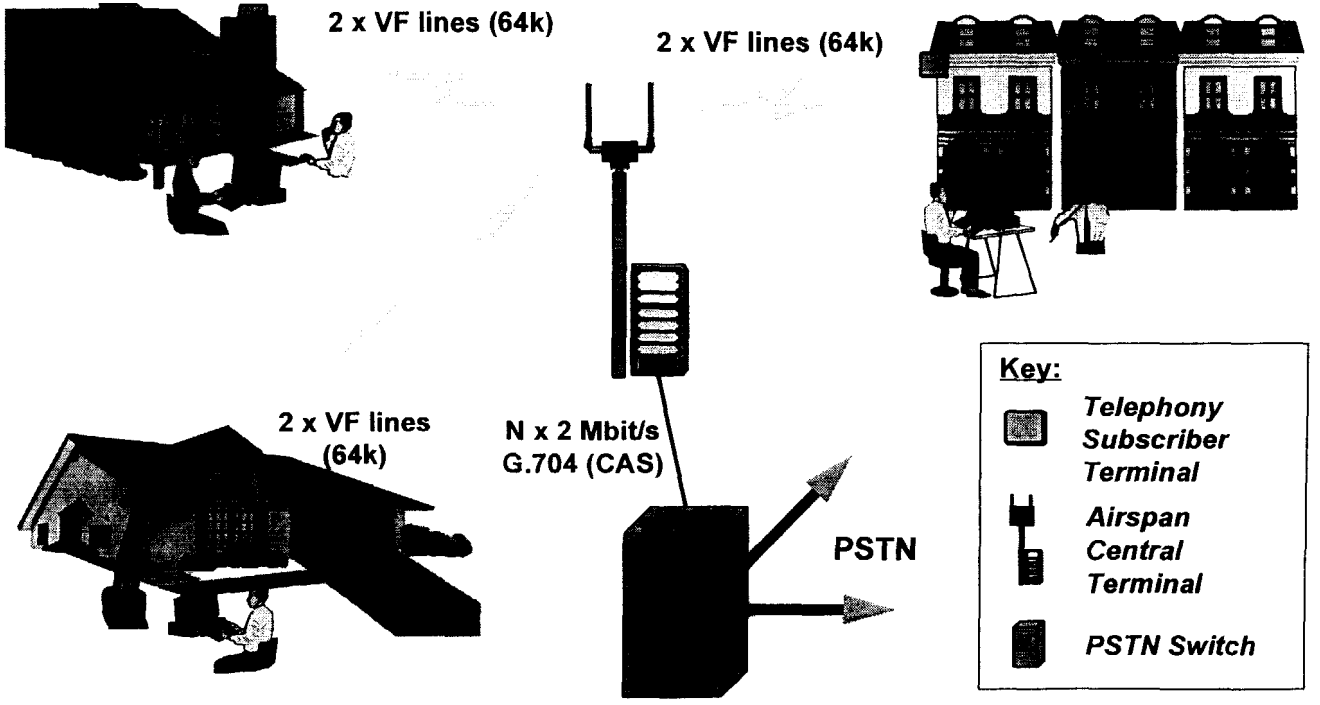
DSC Equipment Deployed

- Airspan and ST-M120 Multi-line Central Terminals
- ST-M120, 1-120 Line Subscriber Terminal

"Advanced Telephony"

Application Characteristics

- Rural or Suburban Deployment
- One or two Lines per End-User
- Analogue Telephony Service (Fully Transparent with PSTN - same as Copper)
- System can provide a "Second" Line for;
  - "Access to the Internet" using Voice-band Modems
  - "The Fax Machine" for Small Business, and Residential



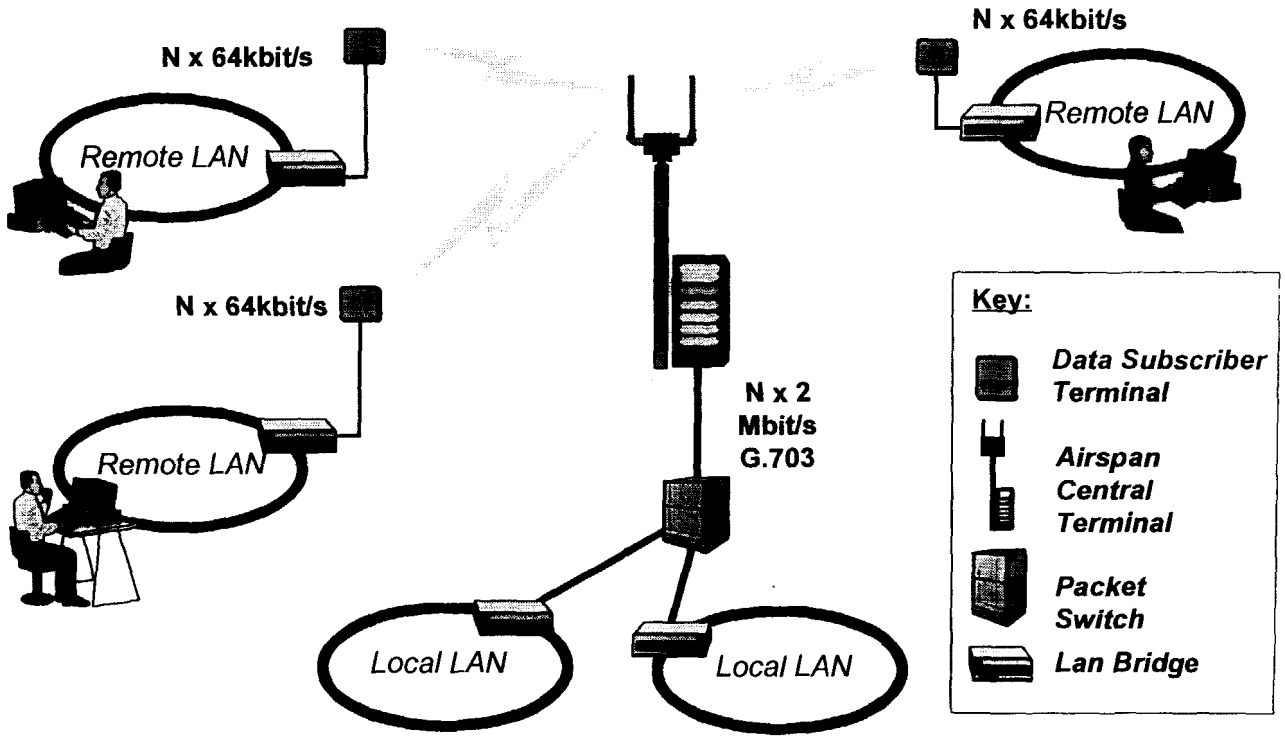
DSC Equipment Deployed

- Airspan Central Terminal
- ST-V2 - Dual Analogue Telephony Subscriber Terminals
- Optionally; Channel Banks (either CP600 or LS120) for VF Switch Interconnect.

"LAN Interconnect" - Data Overlay Networks

Application Characteristics

- Suburban or Urban Deployment
- A Digital Leased Line Service, 64 or 128 kbit/s.
- A Public or Private Application that addresses High Value Niche Customers
  - Banks
  - Multi-Nationals in Developing Countries
  - Specialist Data Applications
- Requires Customer CPE for Interworking between Airspan G.703/704 Interface and target X.25, X.21, V.24 etc....



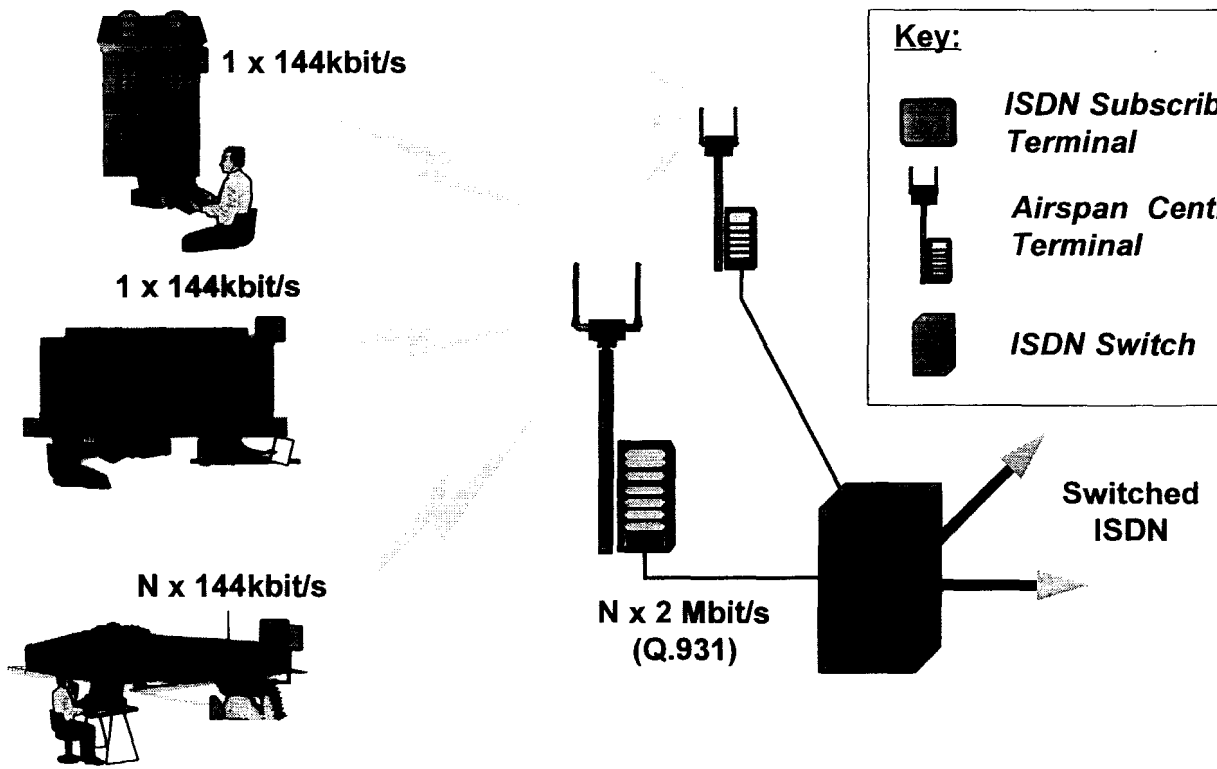
DSC Equipment Deployed

- Airspan Central Terminal
- ST-D128 - 128 kbit/s Digital Data Subscriber Terminal
- Optionally; CP600 as a Multiplexor / Cross-Connect for Interconnect to Host Data Network

"Integrated Voice and Data" - Beyond 3km

Application Characteristics

- Rual and Suburban Deployment
- Basic Rate ISDN Service (144kbit/s)
- Interfaces to network via E1, DSS1 Primary Rate Interface (Euro-ISDN)
- Public and Private Applications
- Allows Basic rate ISDN to be supported to customer beyond 3km from Local Exchange
- Airspan will support all ISDN Services;
  - Telephony (ISDN), Data and Video Conferencing



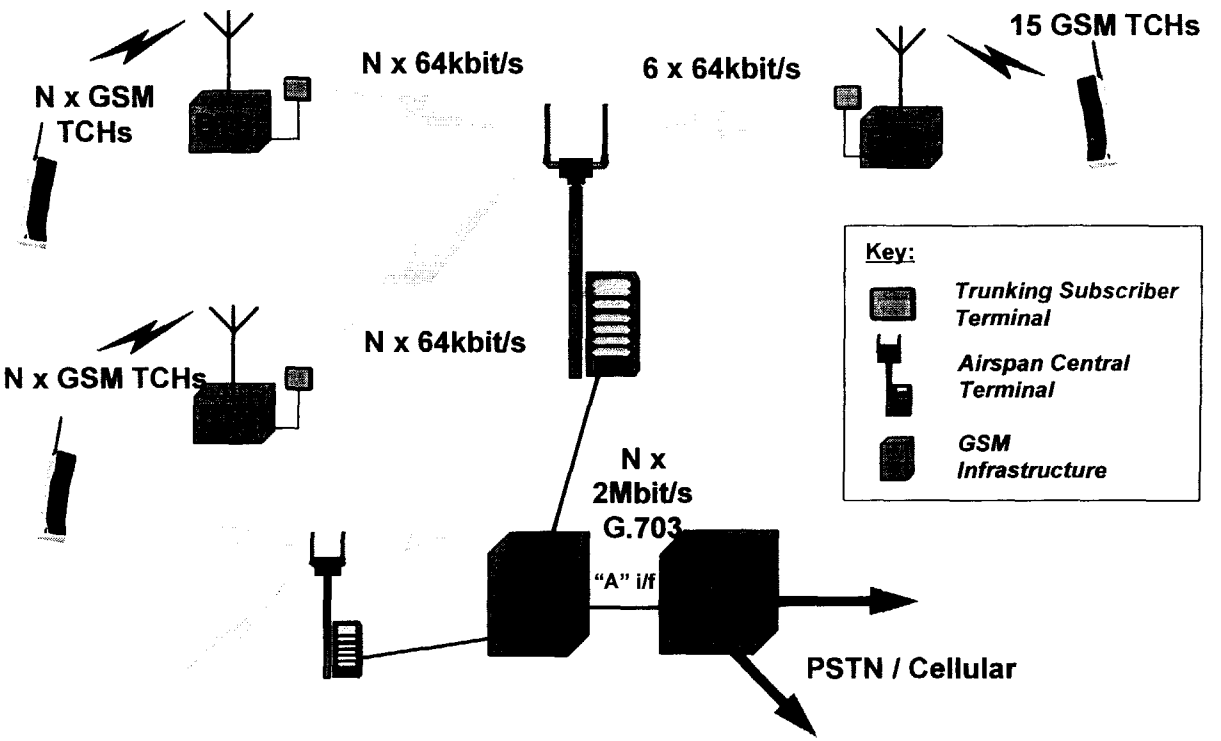
DSC Equipment Deployed

- Airspan Central Terminal
- ST-I1 Basic Rate ISDN Subscriber Terminal
- Optionally; CP600 as a Protocol Convertor to other Network interfaces.

"Microcellular Trunking"

Application Characteristics

- Rual, Suburban and Urban Deployment
- Airspan acts as a Transmission facility for another Radio Network (Cellular: GSM, DCS1800 or PCS, Cordless: DECT, CT2 or PHP)
- Airspan provides N x 64kbit/s to each Base Station
- Customers may include;
  - Cellular Operators
  - PTTs who provide facilities to Cellular Operators
- Airspan is SIGNIFICANTLY cheaper than Point to Point facilities for up to 10, 64kbits/s circuits.



DSC Equipment Deployed

- Airspan Central Terminal
- ST-D128 Digital Data Subscriber Terminal
- CP-600, 3000 or 4000 as Base Station and Network Grooming Cross Connect.

Airspan and CDMA